

WFVA/ITT File Nos.: 911-002.009-1/03GI001 ^{PATENT}

UNITED STATES PATENT APPLICATION

of
Jeremiah D. Quill,
Mark A. Playford
and
Paul J. Biver
for

**DOUBLE MOTOR SEAL
FOR A CLOSE COUPLED CENTRIFUGAL PUMP**

EXPRESS MAIL NO.: EV 393 300 309 US

**DOUBLE MOTOR SEAL
FOR A CLOSE COUPLED CENTRIFUGAL PUMP**

BACKGROUND OF THE INVENTION

1. Field Of Invention

5 The present invention relates to a pumping device; and more particularly relates to a motor sealing arrangement for a close coupled centrifugal pump.

2. Description of Related Art

10 Close coupled pumps are known that utilize the deflector or lip seals supplied by the motor manufacturer to protect the motor bearings from any leakage that may emanate from the pump. Liquid leaking into the motor bearing will result in bearing failure and motor failure. One shortcoming
15 of the known close coupled pump is that, in the event of pump seal failure, the leakage is sprayed on the motor and into the motor bearings causing the bearing to fail. The bearing failure will cause the motor to fail. The seal is part of the motor construction and is not designed to provide
20 protection from the direct spray of a leaking pump. The quality and configuration of the seal are subject to the design whims of the motor manufacturer and vary from manufacturer to manufacturer.

25 Other close coupled centrifugal pumps are also known in the art, including Lipe (United States Patent No. 3,526,469),

which discloses a close coupled centrifugal pump including a sealing housing arranged between a motor housing and a pump housing. The sealing housing has two mechanical face seals arranged in relation to an annular shoulder on shaft 12. The leftmost seal is analogous to a motor seal, while the rightmost seal is the pump seal. Further, Chancellor (United States Patent No. 6,287,074) discloses a close coupled centrifugal pump having a part for attaching a volute with a sealing arrangement, and having an end plate for attaching a plate connected to the volute with different sealing arrangement.

Pumps, systems or assemblies other than a close coupled centrifugal pump, are also known, including: Qandil et al. (United States Patent No. 6,287,074), which discloses immersible motor systems having many different kinds of seal arrangements, including lip seals and a mechanical seal, a double lip seal and hydrodynamic seal, and a double mechanical seal, a labyrinth seal and a rotating centrifugal sealing device; Taniyama et al. (United States Patent No. 4,734,018), which discloses vacuum pumps having many different seals, including a narrow gap sealing means formed of a rotary member, which is positioned in the portion of the peripheral pump stage, and labyrinth seals and threaded seals; Rupp (United States Patent No. 3,746,472), which

discloses a submersible electric pump having a face-type seal, a rotating seal member and a lip-type seal; and Leopold (United States Patent No. 2,277,333), which discloses a pump and motor assembly having a sealing ring.

5

SUMMARY OF INVENTION

10 The present invention provides a new and unique pumping device having a motor arranged in relation to a pumping assembly, the motor having a housing and a shaft extending therefrom for rotating an impeller in the pumping assembly. The pumping device has a motor seal arranged therein between the shaft and the housing, and has a pump seal arranged between the shaft and the pump assembly. The pumping device features a third seal arranged in relation to the motor's
15 shaft for providing additional sealing protection for the motor seal. The pumping device also may include an adapter arranged between a motor housing and a pumping assembly having the third seal arranged thereon.

20 The third seal may be a labyrinth, magnetic or lip seal, as well as a non-contact seal, and may be located on the motor end of the close coupled adapter to function as a primary sealing device.

The pumping device may be a close coupled motor/centrifugal pump or a close coupled motor/positive

displacement pump.

The present invention overcomes the problem in the art by adding a labyrinth seal in front of the motor sealing device. This provides an additional seal of known capabilities to augment the motor sealing device. The labyrinth seal is added to the pump adapter and therefore is part of the pump. This dual sealing is a unique solution providing the motor bearings double protection from pump leakage and the ingress of liquid from wash-down events common to services encountered in close coupled pump applications.

BRIEF DESCRIPTION OF THE DRAWING

The drawing, not drawn to scale, includes the following Figures:

Figure 1 is a side cross-sectional view of a pumping device that is the subject matter of the present invention.

DETAILED DESCRIPTION OF INVENTION

Figure 1 shows a pumping device generally indicated as 10 having a motor 12 arranged in relation to a pumping assembly 14. The motor has a housing 16 and a shaft 18 extending therefrom for rotating an impeller 20 in a housing 15 of the pumping assembly 14, a motor seal 22 arranged

therein between the shaft 18 and the housing 16, and a pump seal 24 arranged between the shaft 18 and the pump assembly 14. The pumping device 10 features a close coupled adapter generally indicated as 30 arranged between the motor housing 16 and the pumping assembly 14 having a third seal 32 arranged in relation to the shaft 18 for providing additional sealing protection for the motor seal 22.

As shown, the third seal is a labyrinth seal 32 located on the motor end of the close coupled frame adapter that serves as a primary sealing device. This labyrinth seal 32, in combination with the close coupled adapter 30, protects the motor seal 22 and motor bearing(s) 34 from liquid that may be spraying from the pump seal chamber or pump stuffing box. In the unlikely event that liquid gets past the labyrinth seal 32, the liquid would be prevented from entering the motor bearing 34 by the motor seal 22.

The scope of the invention is not intended to be limited to using only a labyrinth seal as the third seal 32. For example, the scope of the invention is intended to include using a magnetic seal or a mechanical seal or a lip seal, which could be employed as the third seal 32. This would provide a double or redundant seal to protect the motor bearing.

The scope of the invention is intended to include using

the present invention on close coupled motor/centrifugal
pumps, close coupled motor/positive displacement pumps or
other electric motor driven products that are subject to
wash-down or sprayed liquids during operation while shut
5 down.

Scope of the Invention

Accordingly, the invention comprises the features of
construction, combination of elements, and arrangement of
10 parts which will be exemplified in the construction
hereinafter set forth.

It will thus be seen that the objects set forth above,
and those made apparent from the preceding description, are
efficiently attained and, since certain changes may be made
15 in the above construction without departing from the scope of
the invention, it is intended that all matter contained in
the above description or shown in the accompanying drawing
shall be interpreted as illustrative and not in a limiting
sense.